

CLAIMS

1. A method for producing dimethyl carbonate in which a synthesis gas mainly consisting of hydrogen, carbon monoxide, and carbon dioxide is synthesized by supplying raw material hydrocarbon and steam to a reformer of an external heating system; methanol is synthesized by allowing the synthesis gas to react over a catalyst; and dimethyl carbonate is produced by adding carbon dioxide to the methanol, wherein
  - 10 carbon dioxide in combustion exhaust gas discharged from a combustion radiation section for heating a reaction tube of the reformer is recovered; some or all of the recovered carbon dioxide is mixed in the raw material hydrocarbon to synthesize methanol; and all or some of the remaining carbon dioxide is added to the synthesized methanol to synthesize dimethyl carbonate.

2. The method for producing dimethyl carbonate according to claim 1, wherein

the synthesized synthesis gas is partially oxidized by a partial oxidation furnace, and then methanol is synthesized over a catalyst.

3. The method for producing dimethyl carbonate according to claim 1 or 2, wherein

carbon dioxide used for at least one of the methanol synthesis and the dimethyl carbonate synthesis is carbon

dioxide recovered from combustion exhaust gas discharged from the combustion radiation section for heating the reaction tube of the reformer and/or carbon dioxide recovered from combustion exhaust gas discharged from a 5 boiler existing in the system.

4. The method for producing dimethyl carbonate according to claim 1 or 2, wherein

carbon dioxide used for at least one of the methanol synthesis and the dimethyl carbonate synthesis is carbon 10 dioxide recovered from combustion exhaust gas discharged from the combustion radiation section for heating the reaction tube of the reformer and/or carbon dioxide sent from the outside of the system.

5. The method for producing dimethyl carbonate according to claim 1 or 2, wherein

some of the synthesized methanol is used for the dimethyl carbonate synthesis, and some thereof is left as it is, by which methanol and dimethyl carbonate are produced at the same time.

20 6. The method for producing dimethyl carbonate according to claim 5, wherein

methanol and dimethyl carbonate are produced by appropriately changing the production ratio between methanol and dimethyl carbonate.

25 7. An apparatus for producing dimethyl carbonate,

comprising a reformer of an external heating system including a steam reforming reaction tube and a combustion radiation section arranged around the reaction tube, which synthesizes a synthesis gas containing carbon monoxide and 5 carbon dioxide by supplying raw material hydrocarbon and steam; a methanol synthesizing means for synthesizing methanol by allowing the synthesis gas to react over a catalyst; and a dimethyl carbonate producing means for producing dimethyl carbonate by adding carbon dioxide to the 10 synthesized methanol, wherein

the apparatus further comprises a carbon dioxide recovering device for recovering carbon dioxide in combustion exhaust gas discharged from the combustion radiation section of the reformer; a mixing means of the 15 recovered carbon dioxide in the raw material hydrocarbon, in which some or all of the recovered carbon dioxide is mixed in the raw material hydrocarbon to synthesize methanol; and a mixing means of the recovered carbon dioxide in methanol, in which all or some of the remaining carbon dioxide is 20 added to the synthesized methanol to synthesize dimethyl carbonate.

8. The apparatus for producing dimethyl carbonate according to claim 7, wherein

the apparatus further comprises a carbon dioxide recovering device for recovering carbon dioxide from 25

combustion exhaust gas discharged from a boiler in the system, and a carbon dioxide supplying means for supplying the carbon dioxide recovered from combustion exhaust gas discharged from the boiler to use the carbon dioxide for at 5 least one of the methanol synthesis and the dimethyl carbonate synthesis.

9. The apparatus for producing dimethyl carbonate according to claim 7 or 8, wherein

the apparatus further comprises a carbon dioxide 10 supplying means for supplying carbon dioxide, which is received from the outside of the system, to the methanol synthesizing means and/or the dimethyl carbonate synthesizing means.

10. The apparatus for producing dimethyl carbonate 15 according to claim 7 or 8, wherein

the methanol synthesizing means comprises an out-of-system sending means for sending methanol to the outside of the system and an in-system sending means for sending methanol to the dimethyl carbonate synthesizing means.